

## **Annex II**

### **Technical Specification**

**ITER\_D\_UJ3YQ5 v2.2 dated 30th May 2017**

**For**

***Assistance to EMC support 2017***

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## **1 Purpose**

The Electrical Design Handbook (EDH) part 4 for Electromagnetic compatibility (EMC) is the basis for the designs of all ITER systems. A Contractor is required to provide support to The Electrical Engineering Division during the design of the electrical systems. The expert will be in charge of evaluating the reports provided by the Electrical Engineering Division and making recommendations to address the identified issues.

The objective of this Contract is to support ITER in defining the designs of the systems for the EMC and Earthing, in compliance with the EDH-part 4-EMC and EDH-part 5-Earthing and related international standard related to Nuclear safety. The different ITER systems are reaching a maturity level to be procured and installed, therefore an external support is required to help providing the most appropriate and cost effective design for each system.

## **2 Scope**

The expert shall evaluate the current EMC designs of ITER facility, including electrical systems, building constructions, and provide guidelines for the implementation of such systems to ensure their compliance with the EDH- part 4-EMC and EDH-part 5-Earthing.

## **3 Definitions**

EDH: Electrical Design Handbook

EMC: Electromagnetic compatibility

SRD: System Requirement Document

DDD: Design Description Document

ICD: Interface Control Document

## **4 References**

ITER\_D\_4B523E EDH-part 4 Electromagnetic\_Compatibilit

ITER\_D\_4B7ZDG EDH-part 5 Earthing\_and\_Lightning

ITER\_D\_98JL4W ITER\_DC magfield\_test\_method

## **5 Estimated Duration**

The original duration was up to Sep 01 2019

Additional work is required over the next 36 month period.

## **6 Work Description**

The Contractor shall use its knowledge and experience on EMC acquired in the private industry to evaluate the documentation/sample provided by the EMC Responsible Officer, for the different systems and facilities on ITER site.

## **7 Responsibilities**

The contractor provides technical support to ITER subsystem.

- Provide support to the Electrical Engineering Division during the design of the

Electrical systems.

- Evaluate the reports provided by the Electrical Engineering Division and make recommendations to address the identified issues.
- Support ITER in defining the designs of the systems for the EMC and Earthing, in compliance with the EDH-Part 4-EMC and EDH-Part 5-Earthing.
- Help to provide the most appropriate and cost effective design for each system.
- Evaluate the current EMC designs of the systems.
- Guidelines for the implementation of such systems to ensure their compliance with EDH-Part 4-EMC and EDH-Part 5-Earthing.
- Provide support of cable qualification testing (section 7.1), including many electrical items: resistance, capacitance, crosstalk, transfer impedance and so on.
- Provide support of potential EMC qualification testing for electrical systems of Electrical Engineering Division (about 3 systems per year).
- Provide technical support on ITER EMC lab facility setup. It includes all emission and immunity testing to be done in ITER site, especially for ITER DC magnetic field testing.
- Provide on-site support on EMC/Earthing performance verification for ITER facility (at least once a quarter), including shielding effectiveness testing (building, cable tray, cubicle etc) (Section 7.2), system grounding verification (Junction Box, cubicle etc), lightning protection evaluation and so on. All the travel expenses are in charge of the supplier.
- Man power: 1 person, 2 working days every month during 3 years. Response within 5 working days once any request from ITER (including on-site support).

## 7.1 Electrical test

### 7.1.1 Testing items

There are 4 items to be tested for all configures below:

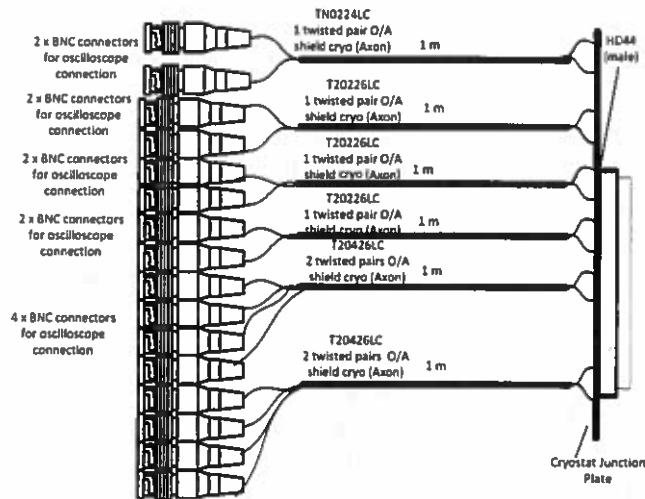
- Electrical Resistance
- Electrical Capacitance
- Transfer Impedance(up to 150MHz)
- Crosstalk(1KHz-50MHz)

### 7.1.2 Testing configure

Configure No.	Cables	Connectors
1	T20226LC AXON	1m w/ con
2	T24026LC AXON	1m w/ con
3	T20426LC SAB	1m w/ con
4	TN0224LC SAB	1m w/ con
5	matrix of T20226LC & T24026LC	w/con
6	matrix of T20426LC & T24026LC	w/con
7	T20226LC, T20426LC,T24026LC to JB with BNC on the ends	w/con

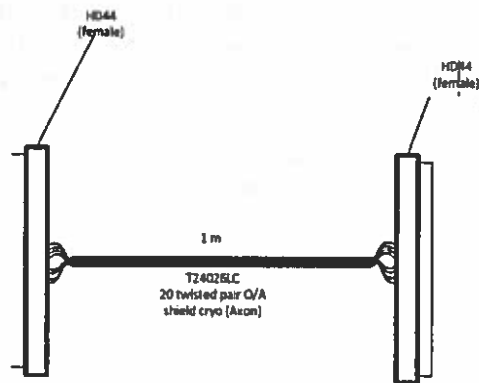
### 7.1.3 Assembly to be provided

- Assembly 1



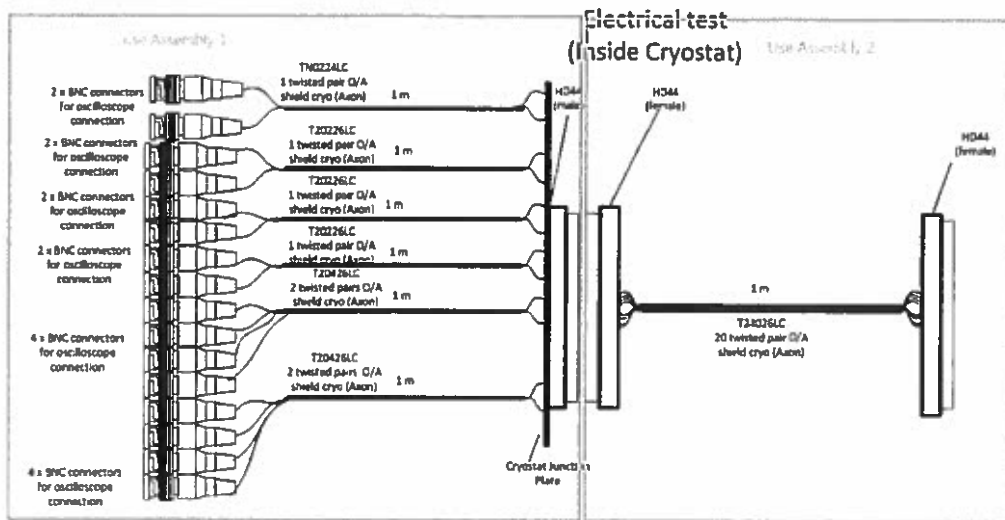
Run Electrical testing separately for TN0224LC, T20226LC and T20426LC.

- Assembly 2



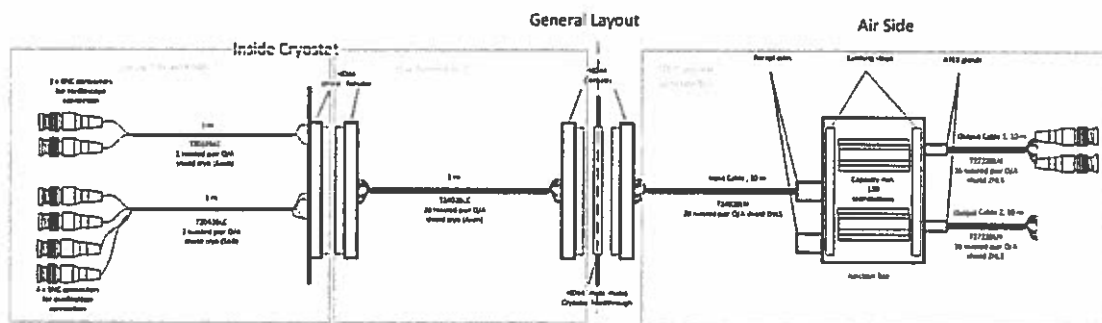
Run Electrical testing for T24026LC.

- Assembly 3



Run Electrical testing separately for matrix of T20226LC & T24026LC and matrix of T20426LC & T24026LC.

- Assembly 4



Run Electrical testing for the whole matrix.

## 7.2 Shielding test

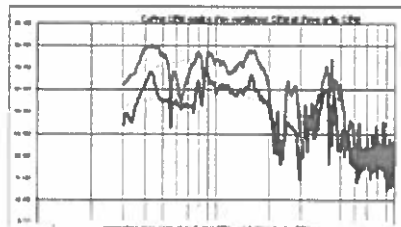
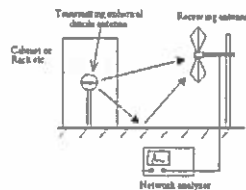
On-site testing: All measurements will be carried out on the ITER construction site. This is to measure the shielding effectiveness in the frequency range of a lightning strike or extending to 1GHz.

- Shielding effectiveness of metallic buildings decking
- Shielding effectiveness of concrete wall



Off-site testing: All measurements will be carried out on outside lab according to IEC61587-3. This is to verify the shielding performance of equipment to be used in ITER site.

- Shielding effectiveness of cubicle(3 samples)
- Shielding effectiveness of cable tray(3 samples)
- Shielding effectiveness of Junction Box(3 samples)



## 8 List of deliverables and due dates

- Quarterly/yearly phase reports including all the recommendations on documents reviewed during that period.
- Separate test/evaluation/technical report within one month based on document/sample provided by ITER.

## 9 Acceptance Criteria

Approval of the regular and separate reports in IDM.

## 10 Specific requirements and conditions

Here list 5 key criteria which are allocated an appropriate number of points, the points totalling 100. This will be the basis of the selection and award process for the technical evaluation.

- DC magnetic test facility setup report, 20 points
- Cable electrical testing and report, 20 points
- Building Cubicle/cable tray/junction box shielding effectiveness testing and report, 20 points
- ITER facility Lightning/Earthing evaluation report 20 points
- Equipment EMC qualification testing and report, 20 points

## 11 Work Monitoring / Meeting Schedule

Kickoff whenever IO request supplier for support, quarterly in general.

Supplier delivers schedule plan within one week. For onsite support, it shall be done within 2 weeks after kickoff.

Supplier delivers report within one month after kickoff.

## 12 Delivery time breakdown

- 1<sup>st</sup> phase by Sep 01 2017, 1<sup>st</sup> phase reports including all the recommendations on documents reviewed during that period.
- 2<sup>nd</sup> phase by Sep 01 2018, 2<sup>nd</sup> phase reports including all the recommendations on documents reviewed during that period.
- A final report at the end of the contract including recommendations on all ITER systems reviewed during the contract.

## 13 Quality Assurance (QA) requirements

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in ITER Procurement Quality Requirements (ITER D 22MFG4).

Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities (see Procurement Requirements for Producing a Quality Plan (ITER D 22MFMW)).

Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO prior to its use, in accordance with Quality Assurance for ITER Safety Codes (ITER D 258LKL).

## 14 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 (“Installation Nucléaire de Base”).

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012 [20].